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**To:** Examiner Erick J. Rekstad**From:** Steven L. Nichols**Fax:** (571) 273-8300**Pages:** 11 pages including coversheet**Phone:****Date:** December 21, 2005**Re:** Notice of Appeal - 09/821,648

☒ **Urgent** ☒ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

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PAGE 1/11 \* RCVD AT 12/21/2005 8:33:11 PM [Eastern Standard Time] \* SVR:USPTO-EFXXRF-6/29 \* DNIS:2738300 \* CSID:8015727666 \* DURATION (mm:ss):03:00

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Application No.: 09/821,648

Attorney Docket No.: 80169-0031 (GNX-31)

## Certificate of Transmission

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In the Patent Application of

Zheng J. Geng

Application No. 09/821,648

Filed: March 29, 2001

For: Method and Apparatus for  
Omnidirectional Imaging

Group Art Unit: 2613

Examiner: REKSTAD, Erick J.

PRE-APPEAL BRIEF REQUEST FOR REVIEW

MS After-Final  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Commissioner:

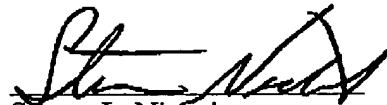
Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.

This request is being filed with a notice of appeal.

The review is requested for the reason(s) stated on the attached sheet(s).

Respectfully submitted,

DATE: 21 December 2005



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## REMARKS

With regard to the prior art, the final Office Action rejects claims 1-6 as unpatentable under 35 U.S.C. § 103(a) in view of the combined teachings of U.S. Patent No. 6,118,474 to Nayar ("Nayar") and U.S. Patent No. 5,870,135 to Glatt et al. ("Glatt"). For at least the following reasons, this rejection is respectfully traversed.

Claim 1 recites:

A method for generating a selectable perspective view of a portion of a hemispherical image scene, comprising the steps of:  
acquiring an omnidirectional image on an image plane using a reflective mirror that satisfies a single viewpoint constraint and an image sensor;  
defining a perspective viewing window based on configuration parameters;  
and  
mapping each pixel in the perspective window with a corresponding pixel value in the omnidirectional image on the image plane using a look-up table based on the configuration parameters.

Nayar is cited because Nayar teaches the collection of a wide-angle image using a truncated, substantially paraboloid-shaped reflector." (Nayar, abstract). However, in contrast to claim 1, Nayar fails to teach or suggest the claimed mapping of pixels from an omnidirectional image to a perspective viewing window "using a look-up table." The current Office Action concedes this point (Action of 9/21/05, p. 2, "Nayar is lacking the use of look-up tables for the mapping.")

Consequently, the Office Action proposed to combine the teachings of Glatt with Nayar. According to the Office Action, "Glatt teaches the mapping from a fish-eye lens (which is hemispherical) to cartesian coordinates using a look-up table." Glatt describes in detail the equations that are used to map the image from the fish-eye lens. (Glatt, col. 7, line 46 to col. 8, line 43). Glatt, however, does not teach or suggest how mapping would be performed using a look-up table for an image that comes, not from a fish-eye lens, but from a reflective mirror as claimed.

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The mapping function of Glatt cannot be imported into the system taught by Nayar because Nayar does not operate on an image produced with a fish-eye lens. The vast differences between the use of a mirror and a fish-eye lens and the problems associated with the use of a fish-eye lens are documented in Applicant's specification at, for example, paragraph 0004.

"An analysis of obviousness of a claimed combination must include consideration of the results achieved by that combination." *Gillette Co. v. S.C. Johnson & Son, Inc.*, 919 F.2d 720 (Fed. Cir. 1990). "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)." M.P.E.P. § 2143.01.

More importantly, "[i]n order to render a claimed apparatus or method obvious, the prior art must enable one skilled in the art to make and use the apparatus or method." *Beckman Instruments, Inc. v. LKB Produkter AB*, 892 F.2d 1547, 1551, 13 U.S.P.Q.2d 1301, 1304 (Fed. Cir. 1989); *In re Payne*, 606 F.2d 303, 314, 203 U.S.P.Q. 245, 255 (CCPA 1979). In the present case, the teachings of Nayar and Glatt, even if combined, do not enable one of skill in the art to make and use the claimed method in which a look-up table is used to map an image from a reflective mirror, rather than from a fish-eye lens.

For any and all of these reasons, the teachings of Nayar and Glatt fail to enable or render obvious the subject matter of claim 1. Therefore, the rejection of claim 1 and its dependent claims based on Nayar and Glatt should be reconsidered and withdrawn.

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Claims 14 and 16-23 were rejected as being unpatentable under 35 U.S.C. § 103(a) in view of the combined teachings of Nayar and U.S. Patent No. 4,908,874 to Gabriel ("Gabriel"). For at least the following reasons, this rejection is respectfully traversed.

Claim 14 recites:

An improved imaging apparatus for generating a two-dimensional image, comprising:  
a reflective mirror configured to satisfy an optical single viewpoint constraint for reflecting an image scene;  
an image sensor responsive to said reflective mirror and that generates two dimensional image data signals to obtain an omnidirectional image on an image plane;  
and  
a controller coupled to the image sensor, wherein the controller defines a perspective viewing window based on configuration parameters and maps pixels from said omnidirectional image into said perspective viewing window; and  
*a memory for storing a mapping matrix for each of a plurality of sets of said configuration parameters in a parameter space, said controller using a said mapping matrix to perform mapping of pixels from said omnidirectional image into said perspective viewing window.*

(emphasis added).

As conceded in the Office Action, "Nayar does not specifically teach the memory for storing a mapping matrix for each of a plurality of sets of said configuration parameters in parameter space." (Action of 9/21/05, p. 10). Consequently, the Office Action cites to Gabriel, which allegedly teaches "the use of matrices to perform transformations such as translation, contraction, expansion rotation and perspective projection." (*Id.*). Applicant respectfully submits that even if this interpretation of Gabriel's teachings is accurate, it is insufficient to base a rejection of claim 14.

Gabriel does not teach or suggest "a memory for storing a mapping matrix *for each of a plurality of sets of said configuration parameters in a parameter space.*" The Office Action fails to indicate how or where Gabriel or any other cited prior art reference teaches or suggests a memory storing a mapping matrix *for each of a plurality of sets of configuration*

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*parameters*. The Office Action does not even expressly allege that Gabriel teaches this subject matter.

Moreover, the Office Action states that the teachings of Gabriel are applicable "to perform complex warping of images such as to a fish-eye image." (Action of 9/21/05, p. 3). As demonstrated above, this further proves the inapplicability of the teachings of Gabriel to claim 14, which calls for a method using an omnidirectional image acquired with a "reflective mirror." The teachings of Gabriel cannot be applied to a method in which mapping is performed using an image from a reflective mirror rather than a fish-eye lens.

"To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)." M.P.E.P. § 2143.03. Accord. M.P.E.P. § 706.02(j). For at least these reasons, the rejection of claim 14 and its dependent claims should be reconsidered and withdrawn.

Claims 31-38 and 44 were rejected as unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Nayar, Gabriel and U.S. Patent No., 6,226,035 to Korein et al. ("Korein").

Similar to claim 14, claim 31 recites:

An imaging apparatus for generating a two-dimensional image, comprising:  
a reflective hyperbolic mirror having a hyperbolic cross-section;  
an image sensor optically coupled to said reflective mirror that generates two-dimensional image data signals based on an omnidirectional image reflected by said mirror; and  
a controller coupled to the image sensor, wherein the controller defines a perspective viewing window based on configuration parameters and maps pixels from said omnidirectional image into said perspective viewing window; and  
a memory for storing a mapping matrix for each of a plurality of sets of said configuration parameters in a parameter space, said controller using a said mapping

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matrix to perform mapping of pixels from said omnidirectional image into said perspective viewing window.

Claim 31 and its dependent claims are patentable over the combination of Nayar, Gabriel and Korein for at least the same reasons given above with respect to claim 14. Therefore, the rejection of claim 31 and its dependent claims should be reconsidered and withdrawn.

Dependent claims 7-9 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Nayar and U.S. Patent No. 5,790,181 to Chahl et al ("Chahl") and U.S. Patent No. 3,988,533 to Mick et al. ("Mick"). This rejection is respectfully traversed for at least the same reasons given above with respect claim 1.

Dependent claims 10-13 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Nayar, Glatt and U.S. Patent No. 5,686,975 to Baker ("Baker"). This rejection is respectfully traversed for at least the same reasons given above with respect to claim 1.

Dependent claims 24 and 25 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Nayar, Gabriel, Chahl and Mick. This rejection is respectfully traversed for at least the same reasons given above with respect to claim 14.

Dependent claims 26-29 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Nayar, Gabriel, and Baker. This rejection is respectfully traversed for at least the same reasons given above with respect to claim 14.

Dependent claim 39 and 40 were rejected as unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Nayar, Gabriel, Korein, Chahl and Mick. This rejection is respectfully traversed for at least the same reasons given above with respect to claim 31.



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Dependent claim 41-43 were rejected as unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Nayar, Gabriel, Korein, and Baker. This rejection is respectfully traversed for at least the same reasons given above with respect to claim 31.